

**CLAIMS**

1. A wireless infrastructure apparatus, the apparatus determining to which users, from among a plurality of users, access is to be provided, such access being provided at any one time to a group of users that includes less than all of the plurality of users, such access being provided to the plurality of users over a plurality of channels, each of the plurality of channels being associated with one of the users and providing communication between the associated user and a common transmitting station, the apparatus comprising:

- a) means for determining for each channel, a value representing the amount of data transmitted on the channel over a predetermined amount of time;
- b) means for receiving a value representing the highest data rate at which each channel can currently receive data;
- c) means for determining, for each channel, a ratio of the received value representing the highest data rate, with respect to the value representing the amount of data transmitted; and
- d) means for transmitting over the channel associated with the highest ratio.

2. A communication system adapted to determine to which users, from among a plurality of users, access to a communication system is to be provided, such access being provided at any one time to a group of users that includes less than all of the plurality of users, such access being provided to the plurality of users over a plurality of channels, each of the plurality of channels being associated with one of the users and providing communication between the associated user and a common transmitting station, the system comprising:

- a) means for receiving an indication of a channel condition of a channel associated with each user;
- b) means for calculating the average channel condition of the channels for which channel conditions are received;
- c) means for determining, for each user, a ratio of the most recently received indication of the channel condition with respect to the average channel condition; and

d) means for transmitting over the channel associated with the highest ratio.

3. A communication system adapted to determine to which users, from among a plurality of users, access to the system is to be provided, such access being provided at any one time to a group of users that includes less than all of the plurality of users, such access being provided to the plurality of users over a plurality of channels, each of the plurality of channels being associated with one of the users and providing communication between the associated user and a common transmitting station, the system, comprising:

- a) means for receiving an indication of an instantaneous channel condition of at least one of the several channels;
- b) means for computing a filter output value for each channel for which the indication of the instantaneous channel conditions are received, the filter output value being a function of the received instantaneous channel conditions;
- c) means for calculating an access metric associated with each channel for which indications are received; and
- d) means for granting access to the communication system to the group of users associated with the best access metric.

4. The system of Claim 3, wherein, for each channel for which indications are received, the access metric is a function of the filter output value and the instantaneous channel condition of the channel.

5. The system of Claim 3, wherein computing the filter output value includes adding, for a particular channel, each received indication of the instantaneous channel condition and dividing by the total number of indications.

6. The system of Claim 5, wherein calculating the filter output value further includes combining each newly received indication to a current filter output value using a low pass filter function.

7. The system of Claim 6, wherein calculating the filter output value further includes selecting a time-constant for the low pass filter.

8. The system of Claim 3, wherein the group of users includes only one  
2 user.

9. The system of Claim 3, wherein only one channel exists between the  
2 common transmitting station and any one user.

10. The system of Claim 1, wherein the indication of an instantaneous  
2 channel condition is an indication of the rate at which the user can receive  
transmissions from the common transmitting station.

11. The system of Claim 3, wherein the indication of an instantaneous  
2 channel condition is a data rate control message.

12. The system of Claim 7, wherein the filter output value for the  $k^{\text{th}}$  channel  
2 is calculated using the following equation:

4 
$$F_k(t+1) = (1-1/t_c) * F_k(t) + 1/t_c * ChC_k$$

6 wherein  $F_k(t)$  is the current filter output value at time  $t$  for the  $k^{\text{th}}$  channel,  $t_c$  is  
the time constant of the low pass filter for the  $k^{\text{th}}$  channel, and  $ChC_k$  is the  
indication of the instantaneous channel condition for the  $k^{\text{th}}$  channel.

13. The system of Claim 12, wherein if the most recent access metric  
2 calculated for the  $k^{\text{th}}$  channel is not less than the most recent access metric  
calculated all of the other channels than the filter output value is calculated  
4 using the following equation:

6 
$$F_k(t+1) = (1-1/t_c) * F_k(t) + 1/t_c * ChC_k$$

wherein  $F_k(t)$  is the current filter output value at time  $t$  for the  $k^{\text{th}}$  channel,  $t_c$  is the time constant of the low pass filter for the  $k^{\text{th}}$  channel, and  $ChC_k$  is the indication of the instantaneous channel condition for the  $k^{\text{th}}$  channel, and wherein if the most recent access metric calculated for  $k^{\text{th}}$  channel is less than at least one recent access metric calculated for another channel than the filter output value is calculated using the following equation:

$$F_k(t+1) = (1-1/t_c) * F_k(t)$$

wherein  $F_k(t)$  is the current filter output value at time  $t$  for the  $k^{\text{th}}$  channel, and  $t_c$  is the time constant of the low pass filter for the  $k^{\text{th}}$  channel.

14. The system of Claim 12, wherein the filter output value is initialized to a predetermined value.

15. The system of Claim 14, wherein the predetermined value is equal to a minimum value for the channel condition divided by the number of users.

16. A communication system adapted to determine to which users, from among a plurality of users, access to a communication system is to be provided, such access being provided at any one time to a group of users that includes less than all of the plurality of users, such access being provided to the plurality of users over a plurality of channels, each of the plurality of channels being associated with one of the users and providing communication between the associated user and a common transmitting station, the system comprising:

- a) means for determining an instantaneous channel condition of at least one of the several channels;
- b) means for computing an average throughput value for at least some of the channels for which the instantaneous channel conditions are determined;
- c) means for calculating an access metric associated with each channel for which the instantaneous channel conditions are determined; and
- d) means for granting access to the communication system to the group of users associated with the best access metric.

17. The system of Claim 16, wherein the instantaneous channel condition is determined based upon the carrier-to-interference ratio of the channel.

18. The system of Claim 16, wherein the average throughput is determined  
2 based upon a data rate at which data was transmitted in previous frames.

19. The system of Claim 16, wherein at least some of the users are available  
2 bit rate users, and wherein the instantaneous channel conditions are determined  
for only those available bit rate users in order to determine which of the  
4 available bit rate users are to be granted access.

20. A communication system for granting access to a code division multiple  
2 access communication system, comprising:

- a) means for providing access to as many constant bit rate users and  
4 variable bit rate users as possible;
- b) means for determining a channel condition for each channel between a  
6 common transmitting station and each of a plurality of available bit rate users  
attempting to gain access to the communication system;
- 8 c) means for determining a throughput value associated with each of the  
channels between the common transmission station and each of the plurality of  
10 available bit rate users;
- d) means for determining an access metric associated with each of the  
12 channels between the common transmission station and each of the plurality of  
available bit rate users; and
- 14 e) means for granting access to those available bit rate users associated  
with the best access metrics if all constant bit rate users and all variable bit rate  
16 users have been granted access.

21. A transmitting station for transmitting to selected users from among a  
2 plurality of users, such selected users including less than all of the plurality of  
users, such transmission being performed to the plurality of users over a  
4 plurality of channels, each of the plurality of channels being associated with one  
of the selected users, including:

- 6 a) means for determining for each channel, a value representing the amount  
of data transmitted on the channel over a predetermined amount of time;
- 8 b) means for a receiver that receives a value representing the highest data  
rate at which each channel can currently receive data;
- 10 c) means for determining for each channel, a ratio of the received value  
representing the highest data rate, with respect to the value representing the  
12 amount of data transmitted and selects at least one user associated with the  
channels having the highest ratios; and
- 14 d) means for transmitting over the channels associated with the highest  
ratios to the selected users.

22. The transmitter of Claim 21, wherein the transmitter transmits to only the  
2 best user over the channel associated with the highest ratio.

23. A transmitting station for transmitting to selected users from among a  
2 plurality of users, such selected users including less than all of the plurality of  
users, such transmission being performed to the plurality of users over a  
4 plurality of channels, each of the plurality of channels being associated with one  
of the selected users, including:
- 6 a) a means for determining a channel condition of a channel associated with  
each user;
  - 8 b) a means for calculating the average channel condition of the channels for  
which channel conditions are determined;
  - 10 c) a means for determining, for each user, a ratio of the most recently  
received indication of the channel condition with respect to the average channel  
12 condition; and
  - d) a transmitter, coupled to the third processor, that transmits over the  
14 channel associated with the highest ratio in response to the third processor.

24. A transmitting station for transmitting to selected users from among a  
2 plurality of users, such selected users including less than all of the plurality of

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users, such transmission being performed to the plurality of users over a plurality of channels, each of the plurality of channels being associated with one of the selected users, including:

- a) means for determining an indication of an instantaneous channel condition of at least one of several channels;
- b) means for computing a filter output value for each channel for which the indication of the instantaneous channel conditions are received, the filter output value being a function of the received instantaneous channel conditions; and
- c) means for calculating an access metric associated with each channel for which indications are received and selects the group of users associated with the best access metric.

25. The transmitter of Claim 24, wherein, for each channel for which indications are received, the access metric is a function of the filter output value and the instantaneous channel condition of the channel.

26. The transmitter of Claim 24, wherein the filter adds, for a particular channel, each received indication of the instantaneous channel condition and divides by the total number of indications.

27. The transmitter of Claim 26, wherein the filter combines each newly received indication to a current filter output value using a low pass filter function.

28. The transmitter of Claim 27, wherein the filter selects a time-constant for the low pass filter.

29. The transmitter of Claim 24, wherein the group of users includes only one user.

30. The transmitter of Claim 24, wherein only one channel exists between the  
transmitter and any one user

31. The transmitter of Claim 21, wherein the indication of an instantaneous  
channel condition is an indication of the rate at which the user can receive  
transmissions from the common transmitting station.

32. The transmitter of Claim 21, wherein the indication of an instantaneous  
channel condition is a data rate control message.

33. The transmitter of Claim 28, wherein the filter calculates an output value  
for a  $k^{\text{th}}$  channel using the following equation:

$$F_k(t+1) = (1-1/t_c)*F_k(t) + 1/t_c *ChC_k$$

wherein  $F_k(t)$  is the current filter output value at time  $t$  for the  $k^{\text{th}}$  channel,  $t_c$  is  
the time constant of the low pass filter for the  $k^{\text{th}}$  channel, and  $ChC_k$  is the  
indication of the instantaneous channel condition for the  $k^{\text{th}}$  channel.

34. The transmitter of Claim 33, wherein if the most recent access metric  
calculated for the  $k^{\text{th}}$  channel is not less than the most recent access metric  
calculated all of the other channels than the filter output value is calculated  
using the following equation:

$$F_k(t+1) = (1-1/t_c)*F_k(t) + 1/t_c *ChC_k$$

wherein  $F_k(t)$  is the current filter output value at time  $t$  for the  $k^{\text{th}}$  channel,  $t_c$  is  
the time constant of the low pass filter for the  $k^{\text{th}}$  channel, and  $ChC_k$  is the  
indication of the instantaneous channel condition for the  $k^{\text{th}}$  channel, and  
wherein if the most recent access metric calculated for  $k^{\text{th}}$  channel is less  
than at least one recent access metric calculated for another channel than  
the filter output value is calculated using the following equation:

$$F_k(t+1) = (1-1/t_c)*F_k(t)$$



14 wherein  $F_k(t)$  is the current filter output value at time  $t$  for the  $k^{\text{th}}$  channel, and  
 $t_c$  is the time constant of the low pass filter for the  $k^{\text{th}}$  channel.

35. The transmitter of Claim 32, wherein the filter is initialized to a  
2 predetermined value.

36. The transmitter of Claim 34, wherein the predetermined value is equal to  
2 a minimum value for the channel condition divided by the number of users.

37. A transmitting station for transmitting to selected users from among a  
2 plurality of users, such selected users including less than all of the plurality of  
users, such transmission being made to the plurality of users over a plurality of  
4 channels, each of the plurality of channels being associated with one of the  
selected users, including:  
6 a) means for determining an instantaneous channel condition of at least one  
of the several channels;  
8 b) means for computing an average throughput value for at least some of  
the channels for which the instantaneous channel conditions are determined;  
10 and  
c) means for calculating an access metric associated with each channel for  
12 which the instantaneous channel conditions are determined and grants access  
to the communication system to the group of users associated with the best  
14 access metrics.

38. The transmitter of Claim 37, wherein the instantaneous channel condition  
2 is determined based upon the carrier-to-interference ratio of the channel

39. The transmitter of Claim 37, wherein the average throughput is  
2 determined based upon a data rate at which data was transmitted in at least one  
previous frame.

40. The transmitter of Claim 37, wherein at least some of the users are  
2 available bit rate users, and wherein the instantaneous channel conditions are  
determined for only those available bit rate users in order to determine which of  
4 the available bit rate users are to be granted access.

41. A transmitter for transmitting to a code division multiple access  
2 communication system, including:

a) processing:

- 4 i) determining a channel condition for each channel between the  
transmitter and each of a plurality of users attempting to gain access to the  
6 transmitter;  
ii) determining a throughput value associated with each of the  
8 channels between the common transmission station and each of the plurality of  
users;  
10 iii) determining an access metric associated with each of the channels  
between the common transmission station and each of the plurality of users;  
12 and  
iv) granting access to those users associated with the best access  
14 metrics.

42. The transmitter of Claim 41, further including:
- 2 a) receiving means for receiving an indication as to whether data transmitted  
to user has been successfully received by the user;
- 4 wherein the processing means adjusts the throughput value associated with a  
user to which data was sent but not received in response to the receiving means  
6 receiving the indication.

43. The transmitter of Claim 39, wherein the processing means selects all  
2 constant bit rate (CBR) users and all variable bit rate (CBR) users before  
selecting any available bit rate (ABR) users.

44. The transmitter of Claim 41, wherein access metrics are only calculated  
2 for ABR users.

45. A wireless communication system for transmitting from a transmitting  
2 station to a receiver in a code division multiple access communication system,  
comprising:

4 a) means for transmitting to as many constant bit rate users and variable bit  
rate users as can be supported;

6 b) means for determining a channel condition for each channel between the  
transmitter and each of a plurality of available bit rate users attempting to gain  
8 access to the transmitter;

10 c) means for determining a throughput value associated with each of the  
channels between the common transmission station and each of the plurality of  
available bit rate users;

12 d) means for determining an access metric associated with each of the  
channels between the common transmission station and each of the plurality of  
14 available bit rate users; and

16 e) means for granting access to those available bit rate users associated  
with the best access metric if all constant bit rate users and all variable bit rate  
users have been granted access.

46. The system of Claim 45, further including:

2 a) means for receiving an indication as to whether data transmitted to user  
has been successfully received by the user;

4 b) means for adjusting the throughput value associated with a user to which  
data was sent, but not received, in response to the receiver receiving the  
6 indication.